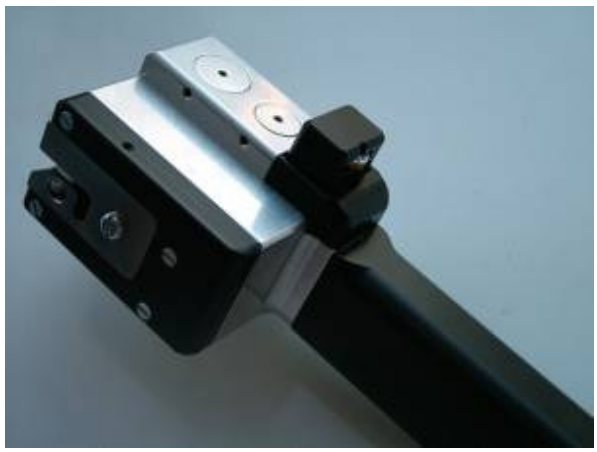
GTW Developments Ltd.

104 Series splicers



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Getting started

Model 104 - getting started

This section is all you really need to get started operating the splicer. The rest of the manual deals with maintenance, and with details of products; these sections will not be needed immediately.

Remove all packaging. For each splicer, you will have the appropriate splicing chamber – which will usually already be fitted.

Depending on what you have ordered, you will have some or all of the following:

- Splicer
- Additional splicing chamber(s)
- Optional carrying strap
- Optional buckle
- Optional hanger and screws
- Optional hanging clip

If they have been supplied, place the buckle and strap over the air union, before connecting the splicer to the air supply. The operator may then loop the strap round his wrist to reduce the likelihood of the splicer being dropped.

It may be useful to have a fixed place to store the splicer temporarily when the operator has finished. If it has been supplied, bolt the hanging clip to a convenient spot on a machine. Fix the hanger to the back of the splicer, using the screws provided. (This operation will involve the removal and replacement of the splicing chamber). The splicer can then be placed in the hanging clip when not in use. This reduces the likelihood of the splicer being dropped and damaged in service.

Connect the splicer to an air line, usual pressure around 6 bar. **(See Appendix 2 for compressed air Health and Safety issues)**

Under normal circumstances, the line pressure should be around 6 bar. The line should preferably be fitted with a pressure regulator so that adjustment may be made to suit local needs.

- Hold the splicer with the trigger button facing the body.
- Look down into the splicer and press the trigger with the thumb.

- See the knives close
- See the pad move until it hits the chamber
- Listen for the air blast

Look at the trigger button. The locking screw on the top of the button will NOT be tight, so the adjuster wheel can be moved. Move the adjuster wheel. See the positions marked on the adjuster wheel, from 0 to 6.

- Set wheel to position 0. Press trigger slowly. See the knives close BEFORE the air blast comes on.
- Set wheel to position 6. Press trigger slowly. See the knives close AFTER the air blast comes on.

This wheel will be used to optimise the performance of the splicer, for any particular yarn.

Making an ends-together splice

Figure 1. First stage: place yarns in splicer

The yarns enter the splicer together, here seen from the right-hand side. The yarns enter via the yarn entry side plate, and leave via the yarn exit side plate.

Figure 2.

The splicer seen from the exit side. In some variants of the Model 104, the configuration on the exit side includes an adjustable yarn clamp; other variants have a plain exit plate, without a yarn clamp.

Figure 3. Second stage: make the splice

Press the trigger in one swift, single movement. Hold the trigger until the chosen blast period has elapsed, or until the fully-formed splice escapes spontaneously from the chamber. Withdraw the completed splice; the two yarns will be tightly intermingled over about 15 mm. Once the yarns have been withdrawn, it will be necessary to part them, and to open up the structure. With the yarns once more in a single line, the characteristic "tail" of the ends-together splice will appear, roughly at right-angles to the line of the yarns.

Optimising splicing performance - knife timing

All splicers of the 104 range are capable of dealing with a wide range of yarn counts. The splicer requires fewer chambers than most in order to cover its operating range. One reason for this flexibility is the technology of the splicing chamber; another reason relates to the special adjuster built into the trigger. The function of the adjuster radically affects the splicer performance. This function needs to be explained, if the splicer is to be used at maximum efficiency.

The adjustment has been made as simple as possible; a small wheel in the trigger button is marked with numbers from 0 to 6 which may be "dialled up" according to the user's needs.

Figure 4.

At setting 0, the knives cut soon after the trigger is pressed - just before the chamber blast.

At setting 3, the knife cut is simultaneous with the chamber blast.

At setting 6, the knives cut only after the main chamber blast has already started

The adjuster wheel should be used to optimise the performance of the splicer for a particular application. The best setting for a given application should be found by trial-and-error. Once the best operating position has been found, the wheel then can be secured with a small locking screw which is built into the top surface of the trigger button. The performance of the splicer should then remain consistent.

Important maintenance information

Apart from accidental damage, and the occasional replacement of cutters, the Model 104 requires very little attention. However, one aspect of maintenance should NEVER be neglected. Both the piston which actuates the chamber pad and the piston which actuates the cutters need regular lubrication. The frequency of lubrication depends upon the nature of the factory environment and the workload on the splicer.

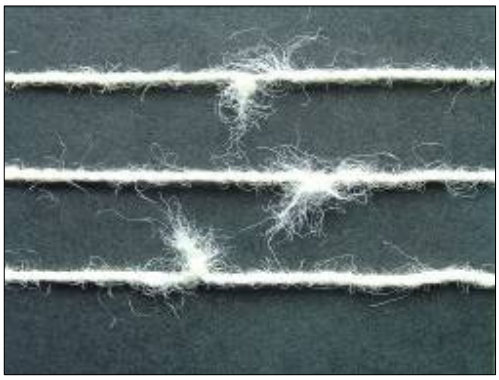
As a general rule, the pistons should be removed and greased with Molykote 111 (available from the company) at least once per month. The service interval should be reduced if the splicer experiences very heavy work loads. The removal of these components is shown in Figures 13 to 18

Model 104 – general product information

104 Series splicers – general

The Model 104 has its origins in the earlier Model 101 and 102 splicers. For some years, the 101 and 102 – very similar to each other in form and function – have been used world-wide, especially in the carpet industry. The 101 has some new features which make it unusually powerful, and economical in use. However, the Model 101 has a very simple manual cutting system, and some users expressed a wish for automatic cutters. This led to the Model 104, which has the same splicing action as the earlier products, but which incorporates automatic cutters.

Figure 5.



Like the Model 101, 104 Series splicers make a joint of the "ends-together" form. This type of splice does not have as good an appearance as a splice of the "ends-opposed" form. "Tails" are visible in each joint. However, the splice is much quicker to make, and is usually completely satisfactory for carpet processes, such as tufting, Wilton and Axminster weaving.

Like the 101, the 104 incorporates improved splicing chambers. With a new, adjustable cutting system fitted, the result was a new splicer which was rather more subtle in its operation than the Model 101. When the 104 was being developed, the opportunity was taken to incorporate modular principles of design. The new splicer therefore is available in 24 different forms, to suit different customer needs. All of the Model 104 series of splicers have a common base unit. Parts are added to the base unit, to make up the complete splicer assembly; conversion from one type to another is very simple.

- All 104 splicers have a simple straight-line string-up.
- All have an unusually simple construction.
- Simple construction leads to simple maintenance; the splicer in its basic form can be completely dismantled and re-assembled in about twenty minutes.
- The splicer has a very strong construction; it resists damage in service very well.
- The splicers contain some new and patented technology, and need a smaller range of splicing chambers than splicers of earlier generations.

- The splicer can join S-twist or Z-twist yarns without any modification; it can even splice S-twist and Z-twist together, or can splice flat yarn to high-twist such as tyre cord.

Typical applications (all models)

Splice format	Ends-together
Typical applications	Carpet weaving Carpet tufting Upholstery Fancy yarns Difficult twist direction applications (S twist to Z twist)
Yarns	Synthetic continuous filament Synthetic staple Wool worsted Wool/synthetic Wool
Yarn count, small splicing chamber	Nm 10 to to Nm 200
Yarn count, standard chamber	Nm 1.5 to Nm 10
Yarn count, large chamber	Nm 0.7 to Nm 1.5
Yarn twist direction	Any twist level, any twist direction, no modification

104 Series splicers – model range

There are 24 splicers in the range, all based upon precisely the same body units.

	MODEL	DESCRIPTION
		12 Splicers fitted with standard, simple side cheeks
1	104 H	104H, 104 with plain long handle
2	104 S	104S, shortened 104 for close-fit mounting to a machine
3	104 B	104B, as 104S, but close-fitted to a moveable carriage
4	104 HW	104HW, as 104H, but fitted with a hanging assembly
5	104 SW	104SW, as 104S, but fitted on the machine with a hanging assembly
6	104 BW	104BW, as 104B, but fitted on the carriage with a hanging assembly
7	104 H RHC	104 H RHC, as 104H, but with special right-hand cut modification
8	104 S RHC	104 S RHC, as 104S, but with special right-hand cut modification
9	104 B RHC	104 B RHC, as 104B, but with special right-hand cut modification
10	104 HW RHC	104HW RHC, as 104HW, but with special right-hand cut modification
11	104 SW RHC	104SW RHC, as 104SW, but with special right-hand cut modification
12	104 BW RHC	104BW RHC, as 104BW, but with special right-hand cut modification

	MODEL	DESCRIPTION
		12 Splicers with special side cheeks (with yarn clamps)
13	104 HY	104HY, 104 with plain long handle
14	104 SY	104SY, shortened 104 for close-fit mounting to a machine
15	104 BY	104BY, as 104SY, but close-fitted to a moveable carriage
16	104 HWY	104HWY, as 104HY, but fitted with a hanging assembly
17	104 SWY	104SWY, as 104SY, but fitted on the machine with a hanging assembly
18	104 BWY	104BWY, as 104BY, but fitted on the carriage with a hanging assembly
19	104 HY RHC	104 HY RHC, as 104HY, but with special right-hand cut modification
20	104 SY RHC	104 SY RHC, as 104SY, but with special right-hand cut modification
21	104 BY RHC	104 BY RHC, as 104BY, but with special right-hand cut modification
22	104 HWY RHC	104HWY RHC, as 104HWY, but with special right-hand cut modification
23	104 SWY RHC	104SWY RHC, as 104SWY, but with special right-hand cut modification
24	104 BWY RHC	104BWY RHC, as 104BWY, but with special right-hand cut modification

Figure 6. Model 104 H. Base unit fitted with simple handle, simple side cheek

The 104 H is the simple hand-held splicer; blast time is controlled by the operator. The picture shows the yarn exit side, and the black housing which accommodates the cutters.

This splicer normally has a handle 100 mm long, but it can be supplied to special order with a handle of any length to suit the customer. (Some customers use the Model 104 S – see below - as a hand-held tool.)

Figure 7. Model 104 S. Base unit without handle, simple side cheek

The 104 S is the simplest splicer of the 104 range. It is very similar to the Model 104 H, but instead of a handle, it has a simple lower cover. It is designed to be fixed to a textile machine, and operated in the fixed position.

As noted above, some customers use the Model 104 S as a hand-held tool.

Figure 8. Model 104 B. Base unit without handle, close-fitted to a carriage running on a rail, simple side cheek

If the Model 104 S is bolted to a carriage assembly, and supplied with a carrier rail, it becomes the Model 104 B, which can run on a rail along the length of a textile machine. The splicer is supplied with air through a flexible hose.

Figure 9. Model 104 HW. Base unit with handle, fitted with hanging assembly

A side view of the Model 104 HW, which is a 104 H hand-held splicer fitted with a hanging assembly. The hanger is an alloy wedge-shaped unit, attached to the rear surface of the splicer. To complete the hanging assembly, a hanging clip is supplied. Here the hanging wedge is shown sliding into the clip. It is normal for the splicer to be supplied with a number of hanging clips, so that the splicer can be "parked" safely in any number of chosen locations on a textile machine.

Figure 10. Model 104 SW. Base unit without handle as 104 S, with hanging assembly

This is the Model 104 SW, which is a 104 S, fitted with a hanging storage assembly. Here the hanging wedge is shown fully fitted into the clip. Usually, the splicer is supplied with a number of hanging clips, so that it can be mounted in any number of chosen locations. This configuration makes the simple 104 S splicer more flexible. When mounted in its hanging clip, it can be used as a fixed splicer, but can be moved simply to another hanging clip, in another fixed position when needed.

Figure 11. Model 104 BW. Base unit, hanger on a carriage assembly, to run on a rail

The flexibility of the Model 104 SW is here applied to the rail-mounted application. A number of machines can be fitted with rails and carriages, and the 104 BW can simply be lifted out of one carriage assembly, and carried to another – back in service, on another machine, in a few seconds.

The remaining eighteen models of the range are derived from the six examples shown above. They have identical functions, but have detail design modifications, as specified in the product tables on pages 12 and 13.

Maintenance and repair

Maintenance - introduction

The 104 has been designed to accomplish its greater variety of functions in the simplest manner possible - great attention has been paid to durability, and ease of maintenance**.** The base splicer of the 104 range has nine sub-assemblies, mounted on a simple body, through which air-ways conduct the compressed air for the splicing action.

1. **Trigger**. Pressing the trigger initiates the splicing operation.

2. **Air valve - blast**. When the trigger is pressed, it moves the valve, allowing compressed air to pass into the main splicer body for splicing.

3. **Air valve - knife**. When the trigger is pressed, it moves the valve, allowing compressed air to pass into the main splicer body for cutting of the waste yarn ends.

4. **Pad.** When the air valve - blast begins to move, it allows compressed air to close the pad onto the surface of the splicing chamber, prior to the splicing operation.

5. **Splicing chamber.** This has a profiled recess on the front face which, with the closed pad, forms the volume in which the splice is formed. Movement of the air valve allows compressed air to enter the chamber, to form the splice.

6. **Side plates**. The side plates provide a means of guiding the yarn across the splicing chamber.

7. **Extension Block**. This provides extra distance between the knife and splicing chamber improving strength and consistency of the splice.

8. **Yarn clamps.** Yarn clamps are fitted to some of the 104 range. They are attached to the side plate on the exit side of the splicing chamber; they restrain the yarns, holding them in the correct position for the splicing operation.

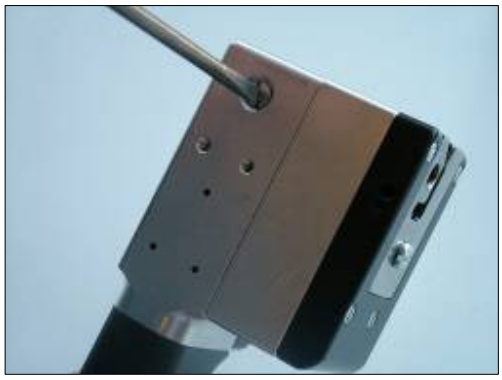
9. **Knives.** Two scissor-knives are fitted, on the exit side of the splicing chamber. These cut off waste yarn during the splicing operation.

Splicing chamber - removal and refitting

WARNING:

If the splicing chamber is removed while the splicer is connected to the air supply, DO NOT press the trigger; the pad will be blown out of the main bore. This will almost certainly damage the pad spring, and entail some remedial work

Figure 12.



To release the splicing chamber, remove the single fixing screw from the rear of the splicer body. The chamber can then be lifted clear of the body.

In the case of the rail mounted splicer, an access hole for the screw is provided in the carriage assembly. In the case of the fixed splicer, the body must be released from the machine to which it is mounted, to give access to the screw. If the splicer is fitted with a hanger, the splicing chamber securing screw is accessible through the hanger.

Replacement is the reverse of removal. Apply a little thread-locking adhesive to the threads of the fixing screw before reassembly. Before finally tightening the screw, take care to ensure that the chamber is exactly positioned and aligned in the splicer body.

Pad assembly - removal, maintenance, refitting

After a period of service, especially if lubrication disciplines have been neglected, the chamber pad movement may become slow, or the pad may jam completely in its bore. At this point, it will be wise to remove the pad assembly for some remedial action. The pad may merely need to be lubricated, or the assembly may be damaged in some way.

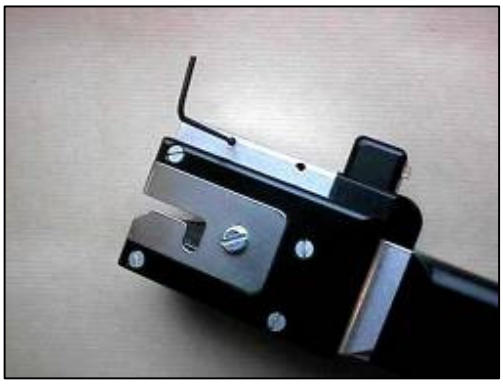
Figure 13. Before work - general

This illustration shows all the sealing plugs, screws and threaded holes visible on the front surface of the splicer. Two large-bore plugs can be seen in the body of the splicer, roughly along the centre line. On the left side of the picture is the upper sealing plug, Item 1102. On the right is the lower sealing plug, Item 1104. Each plug has an M3 threaded hole; the holes in the sealing plugs simplify the dismantling process.

Figure 14. Sealing plug securing screws

Here, the splicer is seen from the side, exposing the small screws which secure the sealing plugs. The two large bore plugs, shown in Fig. 13, are each secured by two small grub-screws, one on each side of the splicer - four screws in all. The threaded holes which accommodate the pair on the left-hand side of the splicer can be seen quite clearly.

Figure 15. Undo plug screws



This picture shows the first stage in the removal of the upper sealing plug. The splicer has two pistons and associated plugs. Each plug is secured by a small grub-screw in the side of the splicer. The upper plug is released by loosening the grub-screw, using a hexagon wrench. The screw on the other side of the splicer is treated similarly.

Figure 16. Top plug removal

This photo shows the start of the removal of the top plug which is part of the chamber-pad sub-assembly.

Once the small securing screws have been loosened, the top plug and chamber pad sub-assembly can be removed. An M3 screw is introduced into the threaded hole in the plug; the plug and chamber pad sub-assembly can then be withdrawn.

Figure 17. Top plug removal

This illustration shows the last stage of removing the chamber pad/plug sub-assembly. With the upper plug released, by the removal of the two small grub-screws, and freed by using an M3 screw, the plug and chamber pad sub-assembly is simply removed as one unit.

Figure 18. Plug and chamber pad assembly

The illustration shows the sub-assembly carrying the chamber pad, separated from the splicer body. At the top is a pointer. Projecting from the left is the screw used to extract the assembly. There are three parts:

Chamber pad, thick disk with O-ring, to the right.

Pad spring, opposite the pointer.

Plug, the largest element, to the left, which also has an O-ring. The spring is screwed and glued into both the plug and the chamber pad.

Maintenance of the plug/pad assembly.

If the assembly appears to be sound, then lubrication should suffice. Grease the O-ring with a small amount of Molykote 111, and replace the assembly, by reversing the dismantling procedure.

If there is sign of damage (usually a misaligned or rusty pad spring), then the assembly should be dismantled and rebuilt. The individual parts may be obtained from GTW Developments Ltd; alternatively the complete assembly can be ordered as Item Number 110201A.

Proceed as follows:

1. The pad is tethered to the upper sealing plug by an extension spring; the spring is screwed into the plug, and the pad is screwed to the spring. Dismantle the assembly by unscrewing the components. Unless it is clearly perfect, discard the spring, and use a new one. Thoroughly clean and degrease the threads in the pad and the plug.

2. Before final assembly, it is necessary to ensure that the components will fit together correctly. It is recommended that the components be "dry-assembled". Screw the spring into the plug until four or five coils of the spring remain exposed. Screw the pad onto the spring for a few turns. Check that the rear face of the pad is parallel to the plug, and that the gap between pad and plug is 1.5 to 2.0 mm. If these two conditions cannot be met, then repeat the process of cleaning and degreasing the threads. When the conditions are met, proceed to final assembly, using adhesive.

3. Apply a drop of Loctite Structural Adhesive 326 to the coils of one end of the spring. Screw the spring into the cap until four or five coils of the spring remain exposed. Allow the adhesive to cure for approximately 30 minutes. Apply more adhesive to the exposed coils, and screw the pad onto the spring. Once more, check that the rear face of the pad is parallel to the cap, and that the gap between pad and plug is 1.5 to 2.0 mm. Leave to cure for a further 30 minutes.

4. Lightly smear the pad and O-ring with Molykote grease, and reassemble, by reversing the order of dismantling.

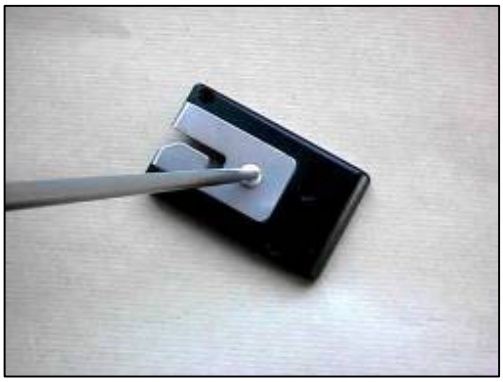
Knife assembly - removal, maintenance, refitting

On each side of the splicer is a knife assembly, consisting of a pair of knives, operating in a scissor action. Each assembly has a fixed knife and a moving knife. The fixed knife is screwed to the body of the splicer, and the moving knife is mounted close to the fixed knife, and is capable of being driven through a small arc, on a pivot pin. This knife is driven by a peg which projects through the splicer body.

Figure 19. The simple splicer side-cheek – removal

This illustration shows a standard side cheek, together with its steel side-plate, which also functions as a yarn guide plate; the standard side cheek is merely an assembly for shrouding the splicer knives, and it carries no additional parts. The illustration shows the first screw being released using a screwdriver.

Figure 20. The simple splicer side-cheek – remove yarn guide plate exit side



Removal of the securing screw allows the side-plate to be withdrawn.

Figure 21. The more complex splicer side-cheek – fitted with yarn clamp

This illustration shows the more complex version of side-cheek, which is a sub-assembly, fitted with a yarn clamp. Like the standard side cheek, this cheek is also fitted to the side of the splicer body using four screws. Note the small rectangular hole in the yarn exit side plate; the function of the hole is to vent air to reduce fibre build-up in the yarn clamp assembly. This side cheek is removed in exactly the same way, by releasing the four countersunk screws.

It may prove necessary to dismantle the side cheek sub-assembly; this process is described in Appendix 3.

Figure 22. Knife assembly in splicer

This illustration shows the splicer, after removal of the side cheek assembly from the splicer body. The knife assembly is now accessible; it consists of a pair of knives, one fixed and one moving. Note the knife drive shaft, a rod just visible at the bottom of the moving knife. Note the circlip and three-legged spring, which together apply a compressive force to the knife assembly

Figure 23. Extension block removal (part 1)

This illustration shows the splicer, after removal of the side cheek assembly from the splicer body. The knife assembly and extension block is now accessible. Also this illustration shows the start of the extension block removal procedure – the upper securing screw is being released.

Figure 24. Knife assembly removal

The knife assembly is secured to the splicer body by two small screws. The illustration shows the start of the knife assembly removal procedure – the upper securing screw is being released.

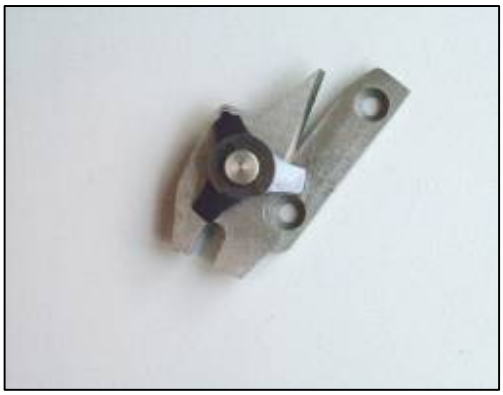
Figure 25. Extension block removal (part 2)

After the knife assembly is removed the extension block can be removed. The illustration shows the start of the extension block removal procedure.

Figure 26. Knife assembly and extension block removed

This illustration shows the splicer once the knife assembly and extension block has been removed from the body. The end of the knife drive shaft can be seen projecting slightly from the splicer body. Over the end of the knife drive shaft is fitted a spacer washer. The spacer imparts a slight scissor angle to the knives. The knife pivot remains in place, coming free only when the fixed knife is removed.

Figure 27. Knife assembly – detail



This illustration shows the outer side of the knife assembly after removal from the 104 body. The assembly comprises: fixed knife, moving knife, circlip, pivot pin, and three-legged spring.

Figure 28. Knife assembly – pivot pin

This illustration shows the inner side of the knife assembly. The view is shown so that the knife pivot pin can be seen.

The knife assembly can be dismantled by removing the securing circlip, either by the sideways push of a small screwdriver, or by the use of a special circlip pliers.

Reassembly

Reassembly is the reverse process.

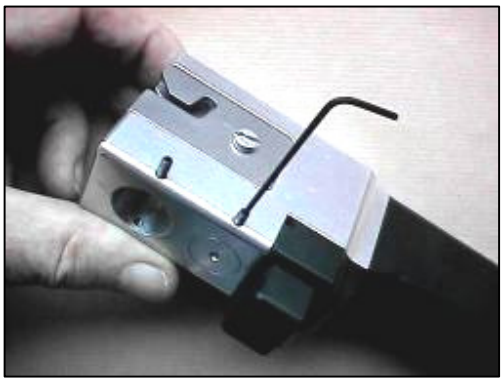
1. Check the condition of the drive peg. It is made of hardened steel, but may have worn after extended service. If its diameter has reduced, then the movement of the knife will be reduced.
2. Check the condition of the spacer. If it is damaged, replace it. The spacer defines the small scissor angle of the knives.
3. The three-legged spring has a small extension to one of its legs. This should be located in a small hole in the moving knife.
4. If the yarn clamp pressure screws were moved while removing the clamp assembly, re-set the clamps.

Knife drive - removal, maintenance, refitting

Removal

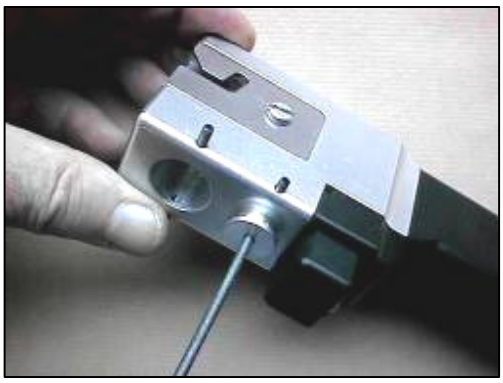
The knives are driven through a simple mechanism by the piston in the upper bore. Air to this piston is controlled by the left-hand air valve. At a point in the travel of the trigger, the knife air valve allows air into the upper bore. The piston is driven forward, carrying with it the shaft, whose two ends project from the splicer body, to drive the knives. Removing the knife drive assembly involves removing the shaft and the drive piston.

Figure 29. Removal of lower sealing plug



This illustration shows the first stages of the removal of the lower sealing plug, under which is accommodated the knife actuating piston. The two small securing grub-screws are loosened using a hexagon wrench (the picture shows the screw on the right-hand side being released) With the small screws released, the plug can be removed, but it is not possible to grip the plug with the fingers.

Figure 30. Removal of lower sealing plug



The plug has been provided with a threaded hole, which may be size M3 or M4, depending on date of manufacture of the splicer. Screw in a length of threaded rod, or a suitable screw. Using the threaded rod, gently withdraw the lower sealing plug, together with its O-ring.

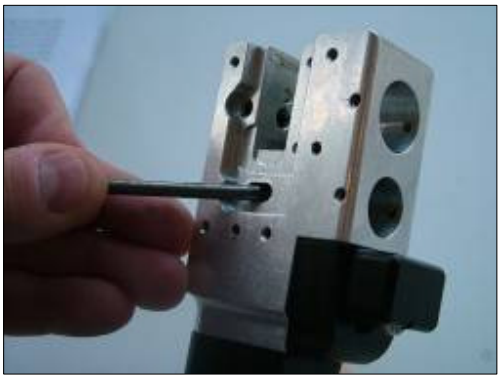
Figure 31. Knife piston plug removal

This frame shows the removal of the knife piston plug. With the securing screws loosened, and the M3 screw in place, the plug can be withdrawn. Once the plug has been removed, the knife actuating piston will be clearly visible inside the lower bore.

Figure 32. Unlock knife drive shaft

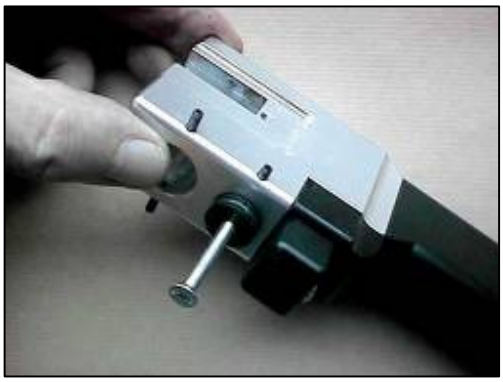
It is necessary to remove the knife drive shaft before the knife drive piston can be removed. This illustration shows the first step in the release of the knife drive shaft. The knife drive shaft passes through a hole in the knife drive piston, and is secured in the piston by a small grub-screw. To release the knife drive shaft, undo the screw, using a hexagon wrench as shown.

Figure 33. Remove knife drive shaft



This picture shows the final stage of the removal of the knife shaft. The last internal components of the splicer body to be removed are the knife drive piston and the knife drive shaft. The knife shaft must be removed first. After the shaft has been released, the shaft can be pushed out through the side of the body as shown. Once the shaft has been removed, the drive piston can be withdrawn.

Figure 34. Remove knife drive piston



The final component to be removed is the knife drive piston.

Removal of the knife drive shaft leaves the drive piston completely free to move in the lower bore. Use a piece of M4 threaded rod, or a long M4 screw, to remove the piston. Turn the screw a few times, so that it enters the threaded hole in the piston. Pull out the screw, and, with it, the piston.

Figure 35. Knife drive piston assembly

This photograph shows the knife drive piston, completely removed from the splicer. Note that the M4 screw remains attached to the piston, after being used to withdraw the component from the splicer. The piston return spring also remains attached, at the left of the frame. Note the hole through which the knife drive shaft passes. Note the two sealing O-rings.

Reassembly

Reassembly is the reverse of the dismantling process. Note the following:

- Apply a small amount of Molykote grease to the piston before inserting it into the splicer body.
- Ensure that the holes in the drive piston line up with the corresponding holes in the splicer body, to allow easy fitting of the shaft.
- Line up the shaft so that it projects equally on either side of the splicer body.
- Be sure to re-tighten the grub-screw which fixes the peg in the piston.
- Lightly grease the projecting tips of the shaft.

9.6. Trigger assembly, valves: removal, refitting

The trigger assembly on the Model 104 is more complex than it seems, because the trigger does not work in a fixed relationship to the actuating valves. The trigger assembly incorporates some features which relate to the advanced performance of the splicer. The use of these elements of the trigger assembly has been described in another section of this manual, dealing with operation.

Figure 36. Removal of trigger button

This illustration shows first stage of removing the trigger button. The trigger button and the trigger housing can be seen. The trigger button is secured to the main air blast valve by a small screw, which passes through the base of the button. The screw is released by using a hexagon wrench as shown. The button is lifted off, complete with the brass knife adjuster wheel.

Figure 37. Trigger off; valves exposed

This frame shows the trigger housing and valves, after removal of the button. The ends of the two main air-valves can be seen projecting from the recess in the trigger housing. Clearly visible inside the recess are two hexagon screws; these screws attach the trigger housing to the main splicer body, and retain the air valves.

Figure 38. Release trigger housing

This illustration shows the first stage in the removal of the black trigger housing. The picture shows the two main air valves. The longer valve, at right, controls the main splicer blast The shorter valve, at left, controls the timing of the knife cut. The trigger housing is released by removing the two socket head screws, The picture shows a hexagon wrench releasing the first of the screws.

Figure 39. Exposure of air valves

This illustration shows the two air valves, just before removal from the splicer. At this stage, the trigger and trigger housing have been removed. The different lengths of the two valves can be seen clearly in the picture. The valves can now be removed. This is done simply by pulling upward. After the valves are removed, the internal components (air shells and O-rings) can be extracted.

Figure 40. Valve assemblies

This photograph shows the two valves which fit inside the main splicer body. The upper, shorter valve controls the knife timing; the lower valve controls the chamber pad and the main air blast. Note the length difference. Both valves are fitted with springs, which bear on the inner surface of the splicer body, to return the valves to the rest position after splicing. Both valves have the same arrangement of shells and O-rings. The arrangement is (from right, or deepest in the bore): O-ring, Shell, O-ring, Shell, Shell, O-ring, Shell, O-ring, Spacer washer.

Refitting

Re-fitting is the reverse of the above. Take particular note of the following:

- The sequence of O-rings and shells should be correct, as shown in the illustration.
- The shells and O-rings should be lightly lubricated with Molykote grease before replacement.
- Since the two valves are different, they should each be fitted in the correct bores.
- When the trigger button is replaced, ensure that its fixing screw enters the small locating hole in the valve stem.

Appendix 1. Troubleshooting

1) Poor splicing

Trouble with splicers generally takes one of two forms:

- Splicing performance deteriorates without apparent breakage or malfunction
- Pieces break or malfunction

This section is concerned only with splicing performance. If there is no apparent damage to the splicer, there may still be something subtle, which cannot easily be seen. It will be best, however, to look at the possible causes which are easy to spot. These include:

Simple checks:

1. Has yarn specification changed markedly? The splicer is very flexible, but it can't do ALL yarns on one configuration. If the yarn has changed, try adjusting the knife wheel
2. Is the air pressure as it should be?
3. Are there any obstructions in the main air line?
4. Are there any signs of obstruction within the splicer itself? (it has been known for foreign matter to get into the air-line, and to obstruct the chamber blast hole; this is usually accompanied by a reduction in the noise level of the blast)
5. Have operating procedures changed?
6. Has the adjusting wheel moved?
7. Are the knives cutting perfectly? Slight deterioration of performance on one side can result in poor splicing.

2) Sticking pad

Occasionally, a pad may stick because of some form of damage to the internal components, but the explanation is normally much simpler; a lack of lubrication around the O-rings which seal the pad assembly, or an extension spring which has come adrift.

Remove the pad assembly. Clean the pad assembly and the surface of the large bore with a small quantity of light solvent

Examine the pad assembly for signs of damage - particularly a damaged or displaced extension spring. If there is damage to any of the components, **proceed as in the section in the main text, dealing with the pad.**

Examine the surface of the large bore. Minor scuffing - the stuff of normal wear and tear in service - should be of no consequence. Look closely, to determine whether the bore surface is scratched. This is a very rare occurrence, usually associated with an earlier rebuild having gone wrong. Minor scratching can generally be rectified with careful use of a reamer.

When any faults have been eliminated, reassemble as in the main text.

3) Poor cutting

Good performance from the cutting knives is essential for satisfactory splicing efficiency.

Most important; is the yarn simply too big or too tough for the splicer? First, there is a simple physical limit to the size of what can fit into the knives. Second, certain materials pose big problems, because of their physical properties. Kevlar, for instance, will blunt standard steel knives very quickly.

Obviously, all knives will eventually become blunt, even in perfectly normal service. If the poor cutting performance is simply a matter of long service, new cutters can be purchased from GTW Developments Ltd. Alternatively, provided that the knives have not worn too far, we can offer a resharpening service.

Sometimes, cutting performance is poor, but it is known that the knives are not near the end of their normal service life. In that case, try some of the following:

3.1) Knife travel

When the splicer is operated, and the knives move, there should be reasonable overlap of the edges in the cutting zone. If there is no overlap, there are a number of possibilities:

- The knives may have been resharpened too many times**. Remove the knives and replace with new. See main text.**
- The shaft may be a sloppy fit in the pocket at the base of the moving knife - this can happen if either the knife slot or the peg have become worn. **Replace knife or peg as appropriate. See main text**
- The shaft may be a sloppy fit in the hole which passes through the knife piston - this can happen if the knife piston – a plastic component – has become worn after long service. **Replace the knife piston. See main text**
- The knife piston may be sticking. **Remove piston, as in the main text.** Service or replace.

3.2) Knife and accessory wear/damage

The knives may appear to be satisfactory, but there may be damage to the cutting edge at its lowest point. This is rare, but may happen if something has happened to force the knives over into an excessive scissor angle. Such misalignment causes chipping of the cutting edge where contact is first made. **Replace the knife, as in the main text.**

Examine the small spacer washers, located on either side of the splicer, over the ends of the shaft. The purpose of the spacer is to provide the slight scissor angle mentioned above. The spacer may be absent, or worn, or damaged. **Replace the spacer, as in the main text.**

Check for correct seating of the compression spring. If it is not seated correctly, **remove and re-seat, as in the main text.**
Check to see whether the arched compression spring has become flatter than normal. If it has, remove the compression spring, and fit a new one.

Appendix 2. Compressed air

Pneumatic splicers are operated by compressed air. Therefore the air supply must be appropriate. The following points are important:

1. Splicers generally operate at a pressure between 3 and 8 bar.
2. Pressure may vary according to application, but it must be as uniform as possible.
3. The air supply should be reasonably dry and clean, with the lowest possible flow resistance.
4. Because the time taken to make a splice is short, transient pressure drops associated with other demands in the mill may become important.
5. When the splicer is operated, line pressure at the splicer head normally drops by about 1 bar. If there are restrictions in the line, air will not be replenished, so that the pressure drop will be greater; weak splices may result.
6. Compressed air installations should therefore be designed to minimise pressure drop.
7. Never use narrow-bore supply tube; this introduces resistance.
8. When there is doubt about the quality of the air supply system, a pressure gauge should be fitted - temporarily - as near as possible to the splicer, so that static pressure and pressure drop can be monitored. This is particularly desirable in an installation which uses long lengths of coiled hose; losses in such hoses tend to be significant.
9. Sometimes, static line pressure is known to be adequate, but there are demonstrable problems with transients. Then it may be useful to fit a few meters of wide-bore pipe or other form of plenum, close to the splicer. This will act as a reservoir, to minimise pressure drops while the splicer is in use.
10. Do not fit lubricators in the line very near to the splicer; an excess of oil on the yarn may weaken the splice.

Compressed air and safety

All our splicers have been designed with safety in mind. The few moving parts have been enclosed or shielded to reduce the possibility of injury to the operator. In normal use, the only component which is in any way a source of hazard is the knife assembly. By design, however, the blades are difficult to reach, and are not dangerous in any normal circumstances. Knives represent a hazard only during removal and disposal. So, in normal use, the splicers present no risk.

However, the splicers do use compressed air, and that has the potential to cause injury:

1. Compressed air is dangerous: avoid any bodily contact with it.
2. Always follow the safety precautions recommended by the compressor manufacturer.
3. Always ensure that unions and connectors are fully tightened and sealed, and that there are no leaks.
4. Check the conditions of air supply lines on a regular basis. Always ensure that any flexible hoses are unblemished; if there are any cuts or abrasions to the outer surface of the hose, stop using the splicer and have the hose replaced by qualified personnel.
5. Do not look into the working parts of the splicer when it is being operated.
6. If a splicer malfunctions, do not use it until it has been repaired by qualified personnel.
7. For maintenance staff, additional advice is necessary. When cleaning or servicing is being carried out, access to the internal mechanism of the splicer is essential. Under these circumstances, maintenance engineers will be at greater risk than ordinary users. The engineer should adhere strictly to the following guidelines:
8. Before undertaking any service work, disconnect the splicer from the air supply.
9. During service work, exercise care while handling knives and springs.
10. Under normal circumstances, always refit safety covers before reconnecting the splicer to the air supply.
11. Under exceptional circumstances, it may be necessary - for test purposes - to reconnect the splicer to the air supply without its safety covers. While the splicer is being tested, wear protective gear and exercise due caution.

Compressed air and noise

A splicer uses compressed air, which for a brief period - about 1 to 2 seconds - is vented to atmosphere while the splice is being made. Air at perhaps 7 bar pressure escapes through a small blast hole, creating intense turbulence in a small volume. Noise is inevitable.

Typical maximum noise levels vary from 80 db to 98 db, depending on the splicing chamber. Some chambers are quieter than others, simply because they have a smaller blast-hole, and allow less air to escape.

Our noisiest splicer, with the biggest blast hole in our range, generates a noise spectrum as shown in the table below:

Hz	63	125	250	500	1000	2000	4000	8000	16000
dB	47	52	57	63	74	89	92	93	95

In practice, splicers are barely noticeable in a textile mill. This is because the other mill machinery tends to be very noisy, and the sound of the splicer is lost in the general noise. Also, the blast only lasts for about one second.

Nevertheless, in compliance with UK health and safety regulations, we recommend that ear defenders (to local standards equivalent to British Standard 6344 Part 1) be worn.

Appendix 3. Yarn clamp side cheek sub-assembly – dismantling and reassembly

This appendix refers specifically to the more complex form of side-cheek, as fitted to some of the 104 range. The side cheek has an integral yarn clamp, to provide improved yarn control during splicing.

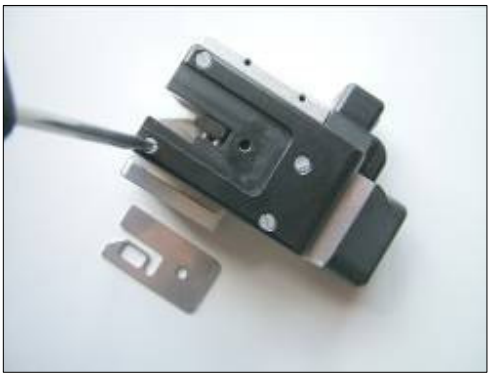
Figure 41. Remove yarn guide plate exit side

Removal of the securing screw allows the side-plate to be withdrawn. This illustration shows the inside of the more complex, yarn clamp side cheek.

Figure 42. Yarn guide plate removed

This picture shows the yarn guide plate after removal. Just visible in the centre of the black side-cheek is the yarn clamp. It may prove necessary, during maintenance, to remove this yarn clamp and replace one or more components.

Figure 43. Remove side cheek

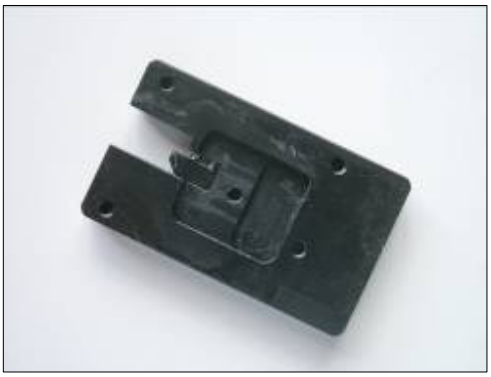


This illustration shows a standard side cheek, together with its steel side-plate, which also functions as a yarn guide plate; the standard side cheek is merely an assembly for shrouding the splicer knives, and it carries no additional parts. The illustration shows the first screw being released using a screwdriver.

Figure 44. Side cheek removed

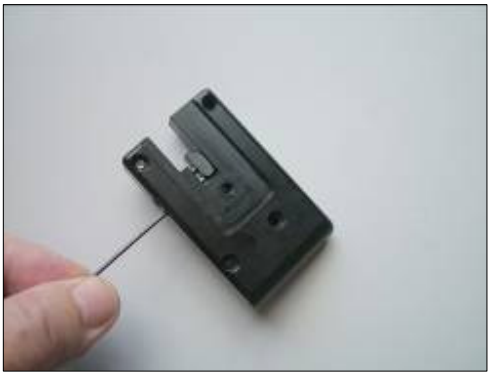
This picture shows the side cheek after removal. The knife assembly has been exposed.

Figure 45. Inside surface of side cheek



Here the inner surface of the side cheek is shown. The yarn clamp assembly is visible just left of centre.

Figure 46. Remove yarn clamp stabilising pin securing screws



Here the first stage of removal of the stabilising pin is shown; remove small socket set screw, using a hexagon wrench. Repeat the process on the other side. The stabilising pin can then be pushed out of the side cheek with a thin implement.

Figure 47. Remove yarn clamp stabilising pin

This picture shows the stabilising pin, and its two grub screws, after removal.

Figure 48. Release yarn clamp adjusting screw

In one edge of the side cheek is a larger hole, through which the yarn clamp adjusting screw can be accessed, using a small screwdriver.

Normally, this screw is used to adjust the compression of the yarn clamp; however, in this instance, unscrew it until it can be removed.

Figure 49. Remove yarn clamp and yarn clamp adjusting spring

Once the yarn clamp adjusting screw has been removed, the yarn clamp itself, and the yarn clamp adjusting spring can be lifted out.

Rebuilding of the yarn clamp assembly is simply the reverse of the dismantling process. Take care to make final adjustment to the spring compression, so that the yarn clamp is correct for the yarn being joined.

Appendix 4. 104 Series splicers – parts list

Description	Item	Part Number	Quantity
1/4 BSPP x BSPP adaptor	157	22000-04-04	1
Knife spring	241	201-1088	1
M4 x 6 slotted pan head screw	254	15-44-06	1
'O' Ring - BS010	264	01-10-10	9
Shell	276	2200-43-04	8
Yarn clamp spring	307	301-1007	1
M3 x 4 socket set screw	501	17-13-04	2
M3 x 6 socket set screw	502	18-13-06	2
M3 x 6 countersunk slotted screw	516	16-43-06	2
Spring knife piston return	530	10-136-013	1
M5 x 20 socket head cap screw	647	11-15-20	2
Spring adjuster wheel	780	10-136-017	1
Spring air valve return	787	10-136-017	1
M4 x 6 socket set screw	869	17-14-06	1
Spacing bush	902	10-133-114	2
Pad (with item 905) – Item 889 without O-ring 905	903	10-113-112A	1
Extension spring	904	10-136-113	1
O-ring pad/upper sealing plug RM-0140-20	905	02-14-20	2
M4 x 16 countersunk slotted screw	908	16-44-16	1
Knife piston 103	1004	10-113-120	1
Lower sealing plug 103	1005	10-135-127	1
Dowel pin 5 x 10	1012	10-137-148	2
O-ring lower bore	1014	02-11-15	3
Blast valve & yarn clamp adjusting screw	1017	10-138-118	2
Splicer body 103	1018	10-100-121	1
Knife piston assembly	1019	10-113-120A	1
Lower sealing plug assembly	1020	10-135-127A	1
Trigger housing 103	1021	10-121-103	1
RH moving knife	1022	10-106-129-1	1
RH fixed knife	1023	10-106-130-1	1
LH moving knife	1024	10-106-129-2	1

LH fixed knife	1025	10-106-130-2	1
Model 103 splicer long handle 100 mm	1026	10-119-102	1
Side cover old type (with no yarn clamp pad ability)	1027	10-177-109	1
Lower cover 103	1029	10-177-110	1
Yarn guide plate (knife side) 103	1031	10-105-149	1
Yarn guide plate (yarn entry side) 103	1032	10-105-150	1
Chamber	1033**	SPECIFY	1
M3 x 16 countersunk slotted screw	1034	16-43-16	4
M5 x 100 socket head cap screw	1035	11-15-100	2
Side cover new type (with yarn clamp pad ability)	1036	10-177-111	1
Side cover new type assembly	1037	10-177-111A	1
Side cover old type assembly	1038	10-177-109A	1
Locking pad	1039	10-111-114	1
M4x4 socket set screw	1040	10-138-114	1
Protection cap 103	1041	10-cap-103	1
M3 x 25 countersunk slotted head screw	1042	25-43-25	2
Knife shaft 104	1043	10-137-154	1
Extension block 104	1044	10-137-155	1
Adjusting wheel	1099	10-173-107	1
Upper sealing plug	1102	10-135-126	1
Upper sealing plug assembly	110201A	10-135-126A	1
Air valve - blast	1104	10-113-121	1
Air valve - knife	1105	10-113-122	1
Knife pivot	1106	10-137-149	1
Yarn clamp pad	1108	10-142-117	1
Spacer - moving knife	1110	10-133-118	1
Trigger button	1111	10-114-102	1
Trigger button assembly complete	111101	10-114-102A	1
Adjusting wheel assembly	1112	10-173-107A	1
Circlip	1124	65-15-21	1
M6 x 6 socket set screw	1125	17-16-06	1
M6 x 4 turned socket set screw	1126	17-16-04	1
M4 x 8 socket head cap screw	1127	11-14-08	2
M3 x 10 socket set screw	1128	17-13-10	2

Scale - adjuster wheel	1130	10-139-138	1
Adjuster wheel pin	1136	10-137-153	1
Hanging assembly parts			
Splicer holding clip	170	201-1199	SPECIFY
C/sunk slotted screw M4 x 16	908	16-14-16	2
M4 x 30 countersunk crosshead screw	1007	10-44-30	1
Hanging wedge (adaptor plate)	1008	10-165-109	1

MODEL 104 Assembly